Mustansiriyah University
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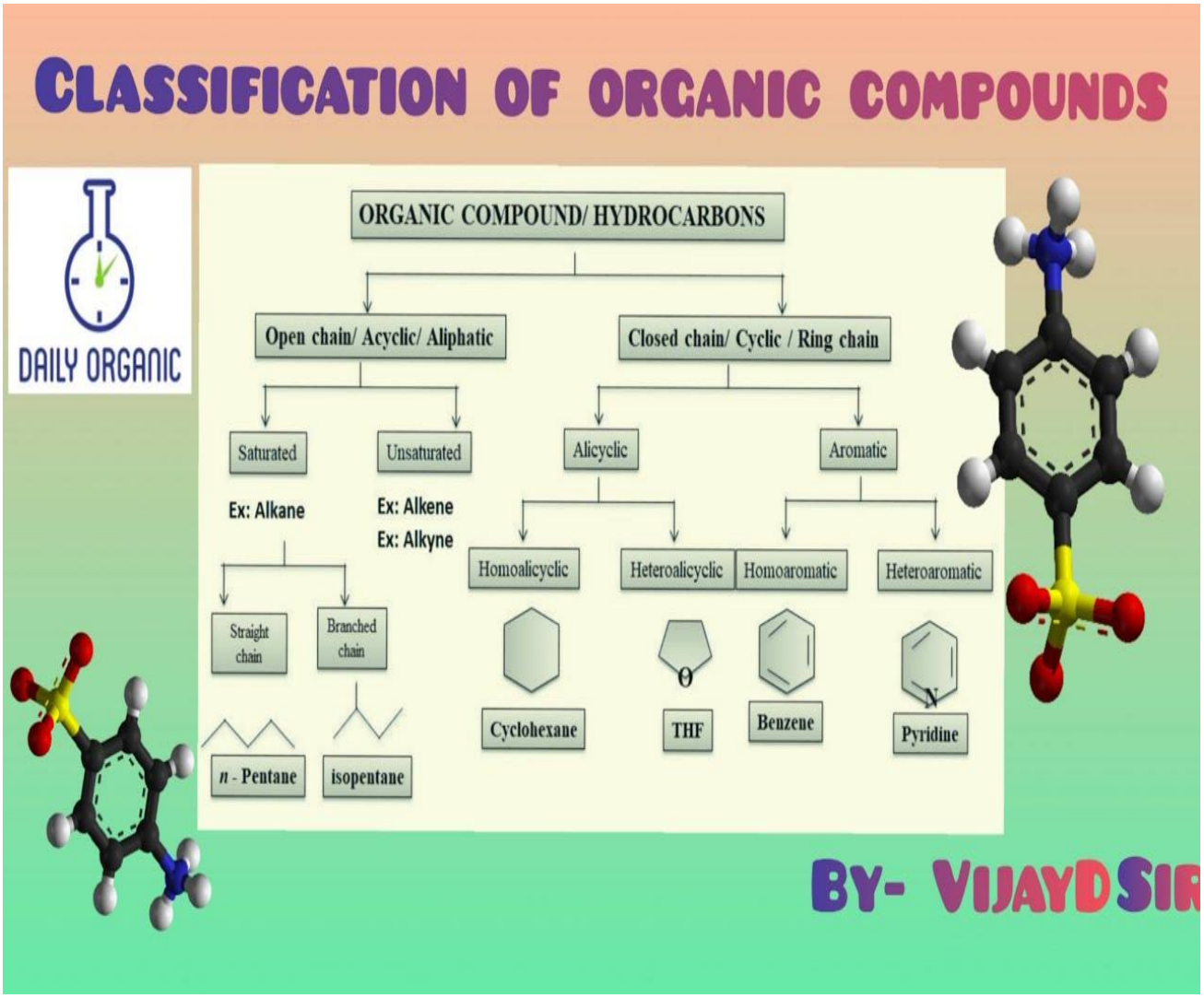
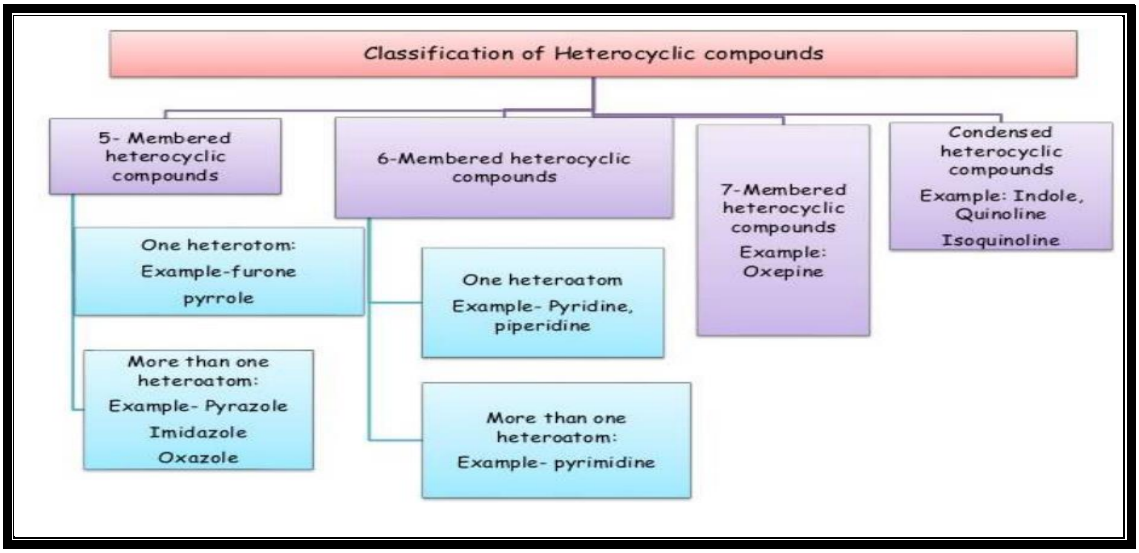
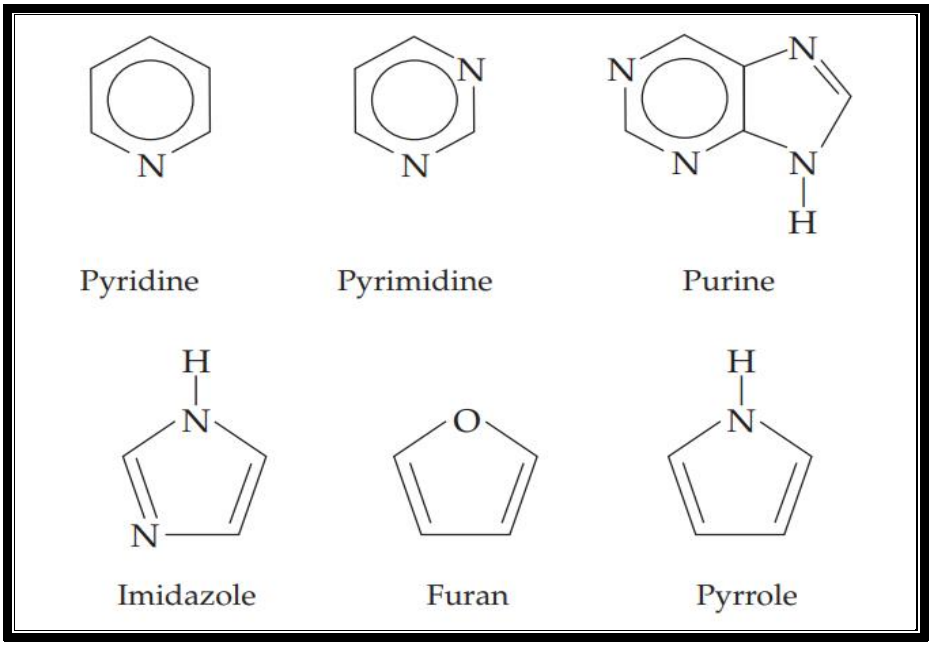
Lecture 5: Heterocyclic compounds





Heterocyclic compounds are cyclic compounds having five- or six-membered rings containing carbon and other element, and the other element may be nitrogen (N), oxygen (O), or sulfur (S). The structures and common names of several heterocyclic compounds are shown below:



- All these compounds are more similar to benzene in stability and chemical behavior than they are to the alkenes.
- Many of these compounds are components of molecules that have significant effects on biological systems. The pyrimidine and purine rings are found in DNA (deoxyribonucleic acid) and RNA (ribonucleic acid). DNA and RNA are the molecules responsible for storing and expressing the genetic information of an organism. The porphyrin ring structure is found in hemoglobin (an oxygen-carrying blood protein), myoglobin (an oxygen-carrying protein found in muscle tissue), and chlorophyll (a photosynthetic plant pigment).
- The indole and pyridine rings are found in many alkaloids, which are naturally occurring compounds with one or more nitrogen containing heterocyclic rings. Alkaloids include cocaine, nicotine, quinine, morphine, heroin

  L-Tryptophan is an amino acid having an indole ring in its structure

- Cocaine is produced by the coca plant. In small doses, it is used as an anesthetic for the sinuses and eyes. In higher doses, cocaine causes an intense feeling of euphoria followed by a deep depression.
- Nicotine is one of the simplest heterocyclic amines and appears to be the addictive component of cigarette smoke
- Quinine, isolated from the bark of South American trees, was the first effective treatment for malaria.
- Morphine was the first alkaloid to be isolated from the sap of the opium poppy. Morphine is a strong analgesic, a drug that acts as a pain killer. However, it is a powerful and addictive narcotic.
- Heroin is produced in the laboratory by adding two acetyl groups to morphine. It was initially made in the hopes of producing a compound with the benefits of morphine but lacking the addictive qualities. However, heroin is even more addictive than morphine.
- Codeine, also produced by the opium poppy, is a less powerful analgesic than morphine, but it is one of the most effective cough suppressants known.
- The pyrrole ring is a component of the porphyrin ring found in hemoglobin and chlorophyll
- The imidazole ring is a component of cimetidine, a drug used in the treatment of stomach ulcers
- Vitamin B6 is one of the water-soluble vitamins required by the body.